

ASTE 529
SAFETY OF SPACE SYSTEMS AND SPACE MISSIONS
TUESDAYS 6:40 – 9:20 PM
SPRING 2019 SYLLABUS

Course Instructor: Michael T. Kezirian, PhD
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COURSE SCOPE AND OBJECTIVES:

This course will teach the concepts of system safety: the methodology and analysis used to certify spacecraft. Through this course technical engineers and program managers with a sound engineering foundation will gain the approach through system engineering to understand, design and certify missions for space applications. The concepts are geared toward human space flight and build on the last fifty years experience of designing and operating crewed vehicles, but the same concepts and approaches also apply to unmanned scientific and communication satellite programs.

COURSE FORMAT:

Spring 2019: 14 course Lectures
Midterm and Final Exams
Class Session: Tuesdays 6:40-9:20pm (Pacific)
Dates: January 8 – April 23
(No scheduled lecture on March 5, midterm examination)
(Class does not meet on March 12, spring break)
Midterm: Tuesday, March 5; Final: May 7
Location: Course available through USC Distance Education Network (DEN) only.

COURSE GRADING:

Homework (Due Weekly):	30%
Mid-term Exam:	30%
Final Exam:	40%
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	Total: 100%

REQUIRED TEXT AND MATERIALS:

- *Safety Design for Space Systems* by Gary Eugene Musgrave, Axel (Skip) M. Larsen and Tommaso Sgobba (ed) Butterworth-Heinemann, 2009
<https://doi.org/10.1016/B978-0-7506-8580-1.X0001-2>
- IAASS-SSI-1700 Commercial Human-Rated System, SAE Aerospace Standard, Issued 2018-07
- Instructor's Course Notes

SESSION-BY-SESSION OUTLINE (SCHEDULE TO CHANGE BEFORE FIRST LECTURE):

Class	Date	Topic	Text	Homework
1	8-Jan-19	Course Introduction, NASA Historical Approaches, Safety Process, Quality and Reliability	1 & 4	Due
2	15-Jan-19	Safety Analyses, Human Ratings, NASA Requirements, Failure Tolerance, Design for Minimum Risk	5 & 19	1
3	22-Jan-19	Electrical and Power Systems & Battery Safety Life Support Systems	16 6	2
4	29-Jan-19	Avionics Safety Software System Safety	14 15	3
5	5-Feb-19	Propulsion Systems Safety	20	4
6	12-Feb-19	Structures and Mechanisms Systems Safety Non-Destructive Evaluation Pyrotechnic Devices Safety	17 Notes 21	5
7	19-Feb-19	Bioastronautics & Crew Escape Systems	3 & Notes	6
8	26-Feb-19	Extravehicular Activity & Docking Systems Crew Systems (Flight Suits, Seats)	22, 8 7 & Notes	7
	5-Mar-19	No Scheduled Lecture; Midterm Examination		8
	12-Mar-19	No Class: Spring Recess March 10-17		
9	19-Mar-19	Oxygen Systems, Toxic Environment Fire	13, 18 27	
10	21-Mar-19	Launch Vehicle Design Risk to Public Considerations	Notes	9
11	2-Apr-19	The Space Environment: MicroMeteoroid and Orbit Debris (MMOD), Space Traffic Management, Space Radiation Effects	2, 10 & Notes	10
12	9-Apr-19	Ground Processing Environment	2.5, 26	11
13	16-Apr-19	Flight Operator & Crew Training as Safety Controls	25	12
14	23-Apr-19	Probability Risk Assessment, Crew Survivability Report	29 & Notes	13
	30-Apr-19	April 27 - 30 Study Days (HW Due April 26)		14, 15
	7-May-19	Final Examination (7:00 – 9:00 PM)		

ACADEMIC CONDUCT

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu> or to the Department of Public Safety <http://adminopsnet.usc.edu/department/department-public-safety>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

SUPPORT SYSTEMS

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.